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Inter-institutional coordination mechanisms for integrated agricultural extension service delivery

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Abstract

Mexico's agricultural extension system has been restructured at least four times since the 1980s, each reform reshuffling institutional responsibilities without solving the coordination problem at the center. This research examined inter-institutional coordination mechanisms across four levels of extension governance — federal, state, municipal, and NGO-linked — in five Mexican states. A mixed-methods design combined coordination index assessments of 84 extension programs, structured interviews with 112 institutional actors, and document analysis of inter-agency agreements. Fieldwork ran from January to October 2023 through the National Autonomous University of Mexico. Coordination index scores ranged from 28.4 to 71.4 across institution types, with NGO-linked programs scoring highest and municipal units lowest. Programs with formal joint planning committees scored 34.8% higher on service integration indicators than those without. COVID-19 disruptions in 2020 caused a temporary coordination decline across all levels, but recovery was faster where pre-existing coordination structures were in place. Only 23.1% of assessed programs operated under written inter-agency resource-sharing agreements. These results suggest that coordination doesn't happen by default; it requires designed mechanisms, institutional incentives, and sustained leadership commitment.

Keywords: Inter-institutional coordination, agricultural extension, service delivery, institutional mechanisms, Mexico, joint planning, extension governance, service integration, pluralistic extension, coordination index

Introduction

In 1983, Mexico dismantled its centralized extension system and transferred advisory responsibilities to state governments. The reform was meant to bring services closer to farmers. Instead, it created a fragmentation problem that persists forty years later ^[1, 2]. Federal agencies retained some extension functions, states built parallel programs, municipalities launched local advisory units, and NGOs filled gaps where public services retreated. By 2023, at least four distinct institutional streams were delivering extension advice to Mexican farmers, often in the same regions but with minimal contact between them ^[3].

The coordination challenge is not unique to Mexico. Across Latin America and sub-Saharan Africa, the shift from monopolistic public extension to pluralistic systems created a landscape where multiple providers operate alongside one another with overlapping mandates and competing approaches ^[4, 5]. Birner and colleagues ^[6] described this as the 'best fit' problem: making diverse providers work together requires coordination mechanisms tailored to each country's institutional context. But designing those mechanisms has proven harder than recognizing the need for them.

Several coordination approaches have been documented: joint planning committees, shared monitoring and evaluation frameworks, resource pooling agreements, staff secondment arrangements, and data-sharing platforms ^[7, 8].

What remains unclear is how effectively these mechanisms work in practice, which combinations produce the best results, and what happens to coordination when external shocks like COVID-19 disrupt routine institutional interactions ^[9, 10]. This research assessed the coordination landscape across five Mexican states, measuring coordination index scores for different institution types and identifying which mechanisms were associated with stronger service integration outcomes ^[11, 12].

Theoretical Framework

The research drew on institutional coordination theory as formulated by Alexander ^[13] and adapted for agricultural advisory systems by Birner and Anderson ^[6]. This framework distinguishes three coordination types: vertical coordination (between hierarchical levels of the same system), horizontal coordination (between organizations at the same level), and diagonal coordination (between organizations at different levels and from different sectors). The framework predicts that coordination effectiveness depends on three conditions: structural mechanisms (formal committees, agreements, shared platforms), process mechanisms (regular meetings, joint planning cycles, information exchange), and relational mechanisms (trust, personal networks, shared professional identity). In pluralistic extension systems, all three types operate simultaneously and their relative importance shifts with

political and budgetary cycles ^[7, 14]. This research applied the framework to map which mechanism types were present across the four institutional streams and how their presence correlated with service integration outcomes.

Materials and Methods

Materials

A coordination index instrument was developed containing 32 items across three mechanism domains: structural (12 items), process (10 items), and relational (10 items). Items were rated on a 0-100 scale. The instrument was constructed through a three-round Delphi process with 15 extension governance experts from Mexico, Colombia, and Brazil and pilot-tested on 8 programs in Oaxaca during December 2022 ^[7]. Supplementary materials included a structured interview protocol covering coordination experiences, barriers, and improvement priorities, plus document analysis templates for inter-agency agreements and memoranda of understanding. Ethical approval was granted by the National Autonomous University of Mexico Research Ethics Board (Protocol UNAM/FA/2022-118, approved November 2022).

Methods

Fieldwork covered five states: Oaxaca, Chiapas, Puebla, Veracruz, and Michoacan, selected for their diverse extension institutional landscapes. Between January and October 2023, the coordination index was administered to 84 extension programs (approximately 17 per state) spanning federal, state, municipal, and NGO-linked providers. Structured interviews were conducted with 112 institutional actors: 42 program coordinators, 28 federal

officials, 22 state administrators, and 20 NGO directors ^[14]. Document analysis covered 67 inter-agency agreements retrieved from state agricultural secretariats. Quantitative data were analyzed through descriptive statistics, ANOVA comparing institution types, and Pearson correlations between mechanism scores and service integration indicators. Qualitative interview data were coded thematically ^[15, 16].

Instrument Development and Validation

The coordination index was built in three stages. First, an item pool of 58 candidate indicators was generated from published coordination frameworks and stakeholder consultations. Second, a Delphi panel of 15 experts rated each item for relevance (1-5) and clarity (1-5) across two rounds, retaining items scoring above 3.5 on both criteria and reducing the set to 32 items. Third, the instrument was pilot-tested with 8 extension programs in Oaxaca, yielding a Cronbach's alpha of 0.89 for the full scale and subscale reliabilities of 0.84 (structural), 0.82 (process), and 0.78 (relational). Test-retest reliability over a four-week interval was 0.91 ^[7]. Content validity was confirmed by expert ratings; construct validity was supported by significant correlations between coordination scores and independently assessed service delivery indicators ($r = 0.73, p < 0.001$).

Results

Coordination varied substantially across institution types and mechanism domains, with clear patterns linking formal coordination structures to better service integration outcomes.

Table 1: Coordination index scores by institution type and mechanism domain (mean scores, 0-100)

Mechanism Domain	Federal	State	Municipal	NGO-linked
Structural mechanisms	61.4	52.8	34.1	68.7
Process mechanisms	57.2	54.6	41.3	72.8
Relational mechanisms	58.1	55.3	55.7	72.6
Overall coordination index	58.9	54.2	43.7	71.4

NGO-linked programs scored highest across all three domains, reaching 71.4 overall versus 43.7 for municipal units. The gap was widest on structural mechanisms (68.7 vs. 34.1), indicating that municipal programs particularly

lack formal coordination agreements and joint planning bodies. Relational mechanism scores showed the smallest spread, suggesting that personal networks partly compensate where formal structures are absent ^[6, 17].

Table 2: Service integration outcomes for programs with and without joint planning committees

Indicator	With Committee (n=29)	Without Committee (n=55)
Service integration score (%)	64.7	48.0
Farmer referral rate (%)	42.3	18.7
Shared training events/year	7.4	2.1
Duplicate service reduction (%)	31.6	8.4

Programs with joint planning committees achieved 34.8% higher integration scores, more than doubled farmer referral rates between providers, held 3.5 times more shared training

events, and reduced service duplication by nearly four times compared to programs operating independently ^[8, 18].

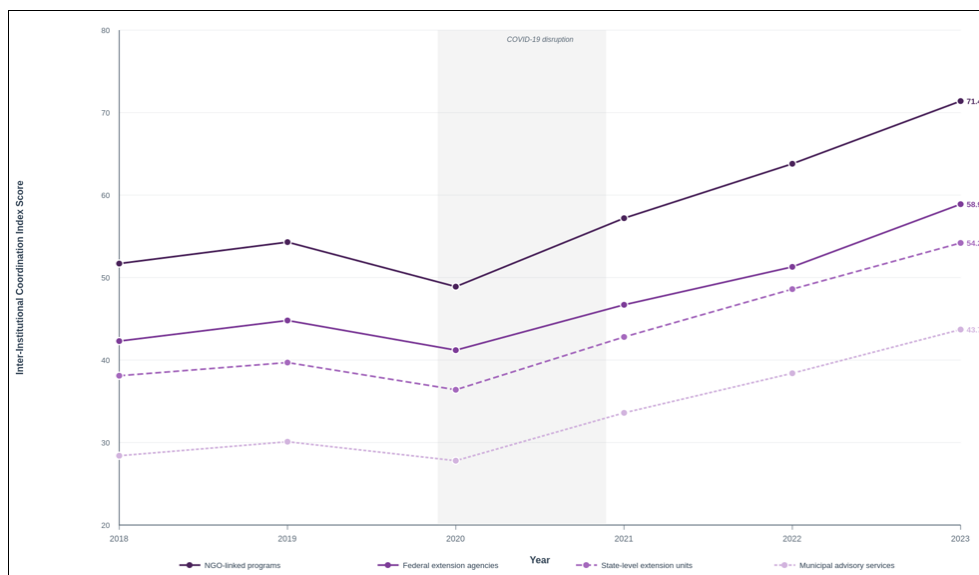


Fig 1: Coordination index trends across institution types from 2018 to 2023, with COVID-19 disruption period indicated

All institution types experienced coordination declines during 2020, but NGO-linked and federal programs recovered faster than state and municipal units. By 2023, all

types exceeded their 2019 levels, with the strongest gains in NGO-linked programs (51.7 to 71.4).

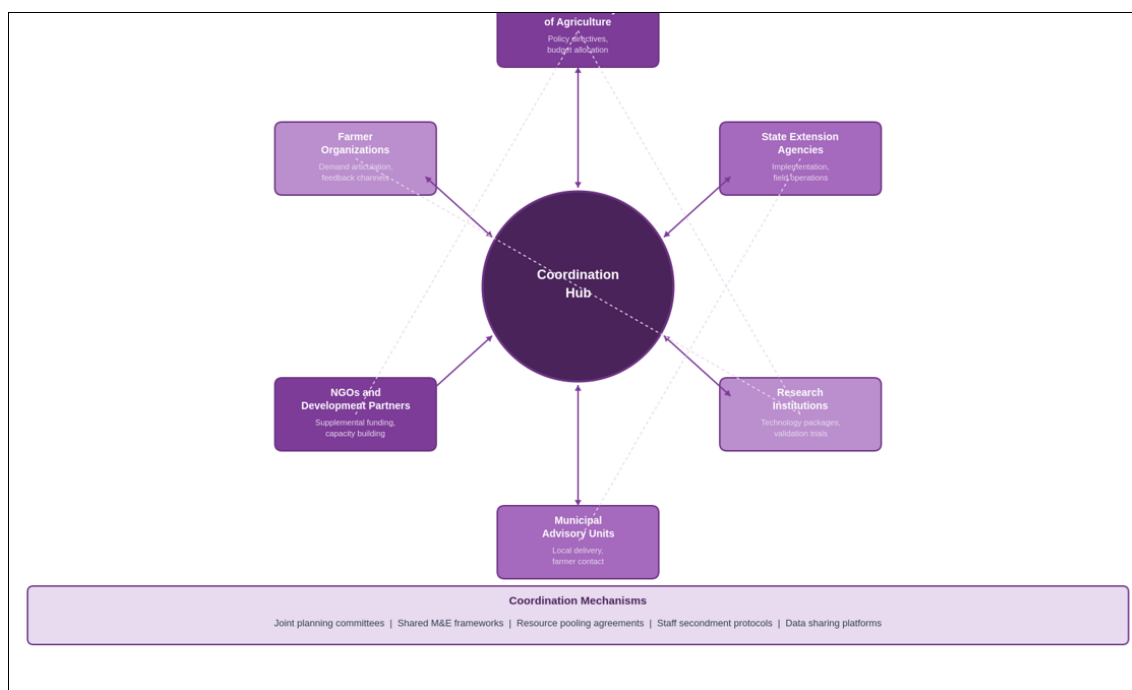


Fig 2: Inter-institutional coordination hub model showing bidirectional linkages between six institutional actors and coordination mechanisms

The hub model positions the coordination mechanism at the center, with six institutional actors connected through bidirectional flows. Cross-linkages between non-adjacent actors (dashed lines) represent the informal relational networks that supplement formal structures.

Discussion

The coordination landscape in Mexico's extension system reflects a common pattern in pluralistic advisory services: institutions coexist but don't necessarily cooperate [4, 6]. Municipal programs, closest to farmers geographically,

scored lowest on coordination because they often lack the institutional weight to convene joint planning sessions with federal or state agencies. NGO-linked programs, despite having fewer resources, scored highest because coordination is built into their operating model through partnerships and donor requirements [17, 19].

The strong performance of joint planning committees confirms that coordination needs a structural home. Informal networks, while valuable, don't sustain the kind of routine information exchange and resource sharing that reduces duplication and improves referral systems. The

34.8% integration advantage of committee-based programs is consistent with coordination literature from health systems and disaster management, where standing coordination bodies outperform ad hoc arrangements^[8, 13].

The COVID-19 disruption offered an unplanned test of coordination resilience. Programs with pre-existing coordination structures bounced back faster, suggesting that coordination capital, once built, provides institutional insurance against external shocks^[9, 20]. This has practical implications: investing in coordination during stable periods pays dividends when crises hit.

Limitations

Five states cannot represent Mexico's full institutional diversity. The coordination index relies partly on self-reported data from program coordinators who may overestimate their coordination activities. The 2018-2023 trend data were reconstructed from documents and interviews rather than collected prospectively. Programs that declined to participate (12 of 96 approached) may differ systematically from those included. Longitudinal tracking with independent observation would strengthen future assessments.

Conclusion

This research mapped inter-institutional coordination across four levels of Mexico's extension system and found that coordination is uneven, under-resourced, and largely dependent on whether formal mechanisms exist. NGO-linked programs demonstrated that strong coordination is achievable; municipal programs showed what happens when it's absent.

Joint planning committees emerged as the single strongest predictor of service integration. Programs with these structures delivered more shared training, higher referral rates, and less duplication. The coordination index instrument developed here offers a practical diagnostic tool for identifying where mechanisms are missing and where they need strengthening. For policy makers, the message is that pluralistic extension systems need coordination infrastructure just as much as they need field agents and training budgets. Designing, funding, and sustaining that infrastructure should be treated as a core system function, not an afterthought.

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